| Inelastic X-Ray Scattering from Cerium Oxide | X21 |
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We performed XRRS experiments on the $L_{III}$ edge of $CeO_2$. Cerium oxide is used as a catalytic support in three-way atomotive catalysis due to ability of cerium in this compound to change oxidation state from $Ce^{4+}$ to $Ce^{3+}$. We believe that this process involves O(2p)-Ce(4f) interatomic charge transfer, and properties of 4f electrons define the ability of cerium oxide to serve as an oxygen buffer. The incident photon energy was adjusted to the positions of the local maxima in the $CeO_2$ $L_{III}$ absorption spectrum. The inelastic scattering intensities are shown in fig. 1-4 as a function of energy transfer. The E*incident* for Fig. 1 was 5740 eV, for Fig. 2, 5734 eV, for Fig. 3, 5729 eV, and for Fig. 4, 5723 eV .For convenience elastic lines are not shown. It is well known that the ground state of cerium oxide consists of the mixture of $4f^0$ and $4f^1$ electron configurations. Thus, a major peak at 6 eV which presents in all the spectra is likely to be attributed to charge transfer into $4f^0$ state of the ground state, whereas a broad maxium centered approximately at 15 eV in two spectra obtained at higher incident energies may originate from charge transfer into $4f^1$ state of the ground state. The origin of a small peak approximately at 9.5 eV in the spectra obtained at lower incident energies is still not clear. The experiments aimed to determine the temperature dependence of the XRRS intensity from cerium oxide are currently in progress.